WHAT IS CLAIMED IS :

1. A bioanalytical assay implemented using at least one array of particles, said assay comprising:

an array of particles formed by the method of dynamically assembling the array of particles at an interface between an electrode and an electrolyte solution, the method comprising the following steps

providing an electrode, an electrolyte solution and an interface therebetween;

providing a plurality of particles located in said electrolyte solution;

illuminating said electrode with a predetermined light pattern; and

generating an electric field at said interface to cause the assembly of an array of particles in accordance with the predetermined light pattern of said electrode

a biochemical protocol implementation unit which effects a biochemical interaction between said first type of molecule and a corresponding first type of analyte to form a first type of paired entity, and a biochemical interaction between said second type of molecule and a corresponding second type of analyte to form a second type of paired entity.

2. The assay of claim 1, further comprising:

a detector for detecting the existence of one of said paired entities;

a decoder for determining the different types of particles; and

a correlator which operates on the output of the detector and the decoder to indicate which types of particles include paired entities.

3. A method of implementing a bioanalytical assay comprising the following steps:

dynamically assembling an array of particles at an interface between an electrode and an electrolyte solution, the method comprising the following steps:

providing an electrode, an electrolyte solution and an interface therebetween;

providing a plurality of particles located in said electrolyte solution, said plurality of particles including a first type of particle and a second type of particle different from said first

type;

illuminating said electrode with a predetermined light pattern; and

generating an electric field at said interface to cause the assembly of an array of particles in accordance with the predetermined light pattern of said electrode; and

implementing a biochemical protocol which effects a biochemical interaction between said first type of molecule and a corresponding first type of analyte to form a first type of paired entity, and a biochemical interaction between said second type of molecule and a corresponding second type of analyte to form a second type of paired entity.

4. The method of claim 3, further comprising the following steps:

detecting the existence of one of said paired entities;

determining the different types of particles; and

correlating the output of the detector and the decoder to indicate which types of particles include paired entities.

5. The method of claim 3, further comprising the step of marking individual distinguishable particles within said particle array by initiating a photochemical color-reaction in response to targeting said particles with a focused illumination source.

6. The method of claim 3, further comprising the step of re-configuring said particle using interactive adjustments of said predetermined illumination pattern to isolate distinguishable particles within said array.

7. The method of claim 3, further comprising the following steps:

attaching a plurality of types of molecules to the surface of said particles, each said particle having a plurality of molecules of one type;

attaching a single distinct type of molecule to said electrode surface;

introducing a plurality of said particles having a plurality of types of molecules into said electrolyte solution; and

disassembling said particle array, retaining and thereby selecting from the plurality of types of molecules initially introduced only those particles having specific types of molecules of demonstrated biochemical affinity for molecules on said electrode surface.

8. The method of claim 7, wherein said particles include antibody-producing cells.

9. The method of claim 3, further comprising the following steps:

attaching a plurality of types of molecules to the surface of said particles, each said particle having a plurality of molecules of one type;

attaching a single distinct type of biological target to said electrode surface;

releasing molecules from said particles at a predetermined location by separating said molecules from said particles in response to a chemical or photochemical stimulus under conditions favoring the biochemical interaction and formation of paired entities between molecules released from said particles and biological targets displayed on said electrode surface; and

marking for identification such types of said particles having molecules which when released cause a detectable response in proximal biological targets.

10. The method of claim 9, wherein said biological targets include cells grown in culture on said electrode, said cells being modified in a detectable way by exposure to said first type of molecules released from said particle array.

11. The method of claim 3, wherein said paired entities include at least one of receptor-ligand, antibody-antigen and enzyme-substrate.

12. The method of claim 3, wherein said paired entities include matching strands of oligonucleotides or strands of DNA or RNA, and formation of said paired entities involves hybridization.

13. A method for performing multiple chemical and biochemical analytical procedures using at least one particle array, said method comprising the following steps:

providing an electrode and an electrolyte solution having an interface therebetween;

generating an electric field at an interface between an electrode and an electrolyte solution;

patterning said electrode to modify the electrochemical properties of said electrode;

illuminating said surface with a predetermined light pattern to control the movement of said particles in accordance with said predetermined light pattern and the electrochemical properties of said electrode;

performing a first procedure on a portion of said particles to produce a first reaction set of particles;

isolating said first reaction set of particles in accordance with said predetermined light pattern; and

performing a second procedure on said first reaction set of particles to produce a second reaction set of particles.

14. The method of claim 13, wherein said performing and isolating steps are interactively controlled in real time by way of an adjustable illumination pattern.

15. The method of claim 13, wherein said performing and isolating steps are dynamically reconfigurable.

16. A method of manipulating nucleic acid, including DNA or RNA, comprising the following steps:

providing an electrode, an electrolyte solution and an interface therebetween;

providing a plurality of nucleic acid molecules in said electrolyte solution, said nucleic acid molecules being in a coiled configuration;

generating an electric field at said interface to cause the movement of said particles;

illuminating said electrode with a predetermined light pattern to create controlled gradients in the flow velocity across the nucleic acid, said velocity gradient causing different portions of the nucleic acid to move at different velocities such that the nucleic acid is stretched in the direction of the local velocity gradient; and

maintaining a stagnation point of zero velocity such that the nucleic acid is substantially fixed in position.

17. A bioanalytical assay implemented using at least one array of particles, said particles being suspended at an interface between an electrode and an electrolyte solution, said assay comprising:

an electrode and an electrolyte solution therebetween;

a plurality of molecules located in said electrolyte, said molecules including a first type of molecule and a second type of molecule;

a biochemical protocol implementation unit which effects a biochemical interaction between said first and second types of molecules, said interaction resulting in the formation of paired entities, and said implementation unit operating to detect the formation of said paired entity;

a plurality of particles located in said electrolyte solution;

an electric field generator which generates an electric field at said interface;

said electrode being patterned to include at least one area of modified electrochemical properties; and

an illumination source positioned to illuminate said surface with a predetermined light pattern to control the movement of said particles in accordance with said predetermined light pattern and the electrochemical properties of said electrode.

18. An apparatus for performing multiple chemical and biochemical analytical procedures using at least one particle array, said apparatus comprising:

an electrode and an electrolyte solution having an interface therebetween;

an electric field generator which generates an electric field at an interface between an electrode and an electrolyte solution;

said electrode being patterned to modify the electrochemical properties of said electrode;

an illuminating source which illuminates said surface with a predetermined light pattern to control the movement of said particles in accordance with said predetermined light pattern and the electrochemical properties of said electrode;

means for performing a first procedure on a portion of said particles to produce a first reaction set of particles;

means for isolating said first reaction set of particles in accordance with said predetermined light pattern; and

means for performing a second procedure on said first reaction set of particles to produce a second reaction set of particles.

19. An apparatus for manipulating nucleic acid, including DNA or RNA, said apparatus comprising:

an electrode, an electrolyte solution and an interface therebetween;

a plurality of nucleic acid molecules in said electrolyte solution, said nucleic acid molecules being in a coiled configuration;

an electric field generator which generates an electric field at said interface to cause the movement of said particles;

said electrode being patterned to include areas of modified electrochemical properties which in conjunction with said electric field create controlled gradients in the flow velocity across the nucleic acid, said velocity gradient causing different portions of the nucleic acid to move at different velocities such that the nucleic acid is stretched in the direction of the local velocity gradient, wherein a stagnation point of zero velocity is maintained such that the nucleic acid is substantially fixed in position; and

an illumination source which illuminates said electrode with a predetermined light

pattern to create controlled gradients in the flow velocity across the nucleic acid, said velocity gradient causing different portions of the nucleic acid to move at different velocities such that the nucleic acid is stretched in the direction of the local velocity gradient.